GLOBAL CLIMATE HIGHLIGHTS

MAJOR CLIMATIC EVENTS AND ANOMALIES AS OF FEBRUARY 1, 1992

1. *Western North America:*

MORE MILD WEATHER.

Many daily high temperature records were broken from the Pacific coast to the upper Mississippi Valley as temperatures averaged up to 16°C above normal. Some January and February monthly records fell as temperatures exceeded 20°C in parts of Montana [8 weeks].

2. *Northwestern United States:*

MOISTURE DEFICITS REMAIN.

Although abundant rains of up to 250 mm fell along the coast, the interior Pacific Northwest remained unusually dry [5 weeks].

3. *Southern United States and Northern Mexico:*

WET WEATHER PERSISTS.

Unusually strong high level winds continued to bring moisture and heavy rain to the region, where up to 135 mm drenched parts of southern Louisiana and 140 mm inundated sections of Mexico. Minor flooding was reported across the southern Plains, Gulf Coast, and southeastern Atlantic [16 weeks].

4. *East-Central South America:*

DRYNESS EXPANDS.

Little or no precipitation fell in most areas as dryness overspread most of eastern Paraguay, southern Brazil, and northeastern Argentina [5 weeks].

5. *Europe and the Middle East:*

VERY DRY WEATHER CONTINUES.

Less than 15 mm of precipitation fell throughout the area as moisture deficits continued to grow [5 weeks].

6. *Middle East:*

ABNORMALLY CHILLY CONDITIONS PERSIST.

Temperature departures dipped to -10°C across much of the Middle East while heavy snow caused avalanches and snowslides that took more than a hundred lives in southeastern Turkey, according to press reports [10 weeks].

7. *Southern Africa:*

DRY CONDITIONS PREVAIL.

Although 20 to 50 mm of rain dampened parts of the Transvaal, most locations received less than 15 mm as abnormally dry weather returned. Press reports indicate that serious harvest shortfalls may occur because of the inadequate rainfall [8 weeks].

8. *Philippines and Northern Borneo:*

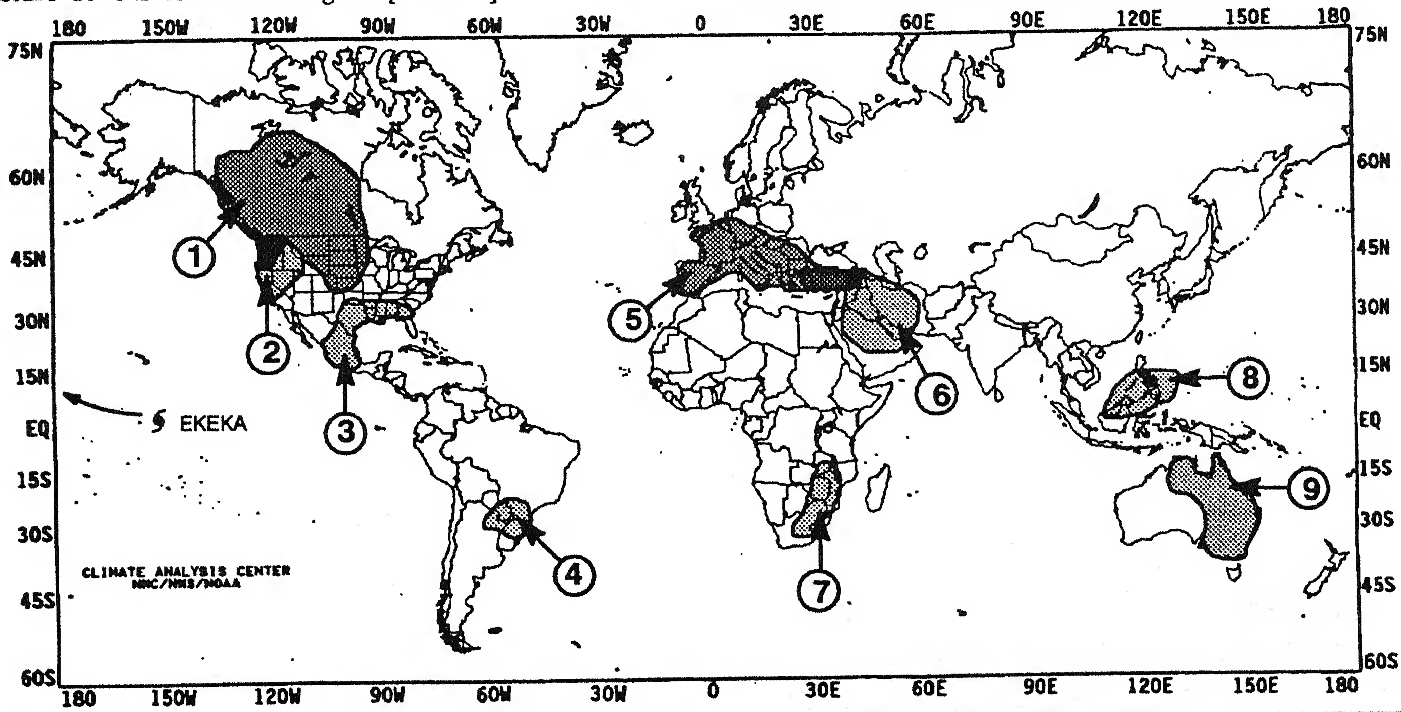
SCANTY RAINFALL AGAIN OBSERVED.

Less than 40 mm of rain was reported at most locations as typical afternoon thundershower activity remained suppressed [5 weeks].

9. *Northern and Eastern Australia:*

LIGHT RAINS BRING LIMITED RELIEF.

Most of Queensland received 20 to 50 mm of rain, with lesser amounts along the northeastern coast, across the Cape York Peninsula, and throughout the southeastern quarter of the continent. The precipitation provided only limited relief to the parched region [4 weeks]. Near normal temperatures returned to the region [Ended at 3 weeks].



EXPLANATION

TEXT: Approximate duration of anomalies is in brackets. Precipitation amounts and temperature departures are this week's values.
MAP: Approximate locations of major anomalies and episodic events are shown. See other maps in this Bulletin for current two week temperature anomalies, four week precipitation anomalies, long-term anomalies, and other details.

UNITED STATES WEEKLY CLIMATE HIGHLIGHTS

FOR THE WEEK OF JANUARY 26 – FEBRUARY 1, 1992

Exceptionally warm mid-winter weather enveloped a large part of the central U.S. while wet and windy conditions battered the northern Pacific coast. Nearly three dozen record daily highs were established from the Pacific Northwest to the upper Midwest. Readings topped 70°F from the central Plains to the northern High Plains, with some locations nearly 40°F above normal on Friday and Saturday. The mercury reached 72°F at Miles City, MT on Friday, establishing a monthly record for January while Dickinson, ND observed a monthly record high for February when the temperature soared to 68°F on Saturday. Above normal temperatures have affected parts of Montana and the Dakotas for eight consecutive weeks, resulting in the warmest January ever recorded in Glasgow, MT and a tie for the warmest on record at Rapid City, SD. Elsewhere, a series of storms pounded the northern Pacific coast, dumping more than 9 inches of rain and generating wind gusts near 100 mph. Quillayute, WA recorded more than 9 inches of rain during seven consecutive days with precipitation. To the south, winds gusted to 97 mph at Oceanside, OR on Friday. Strong wind gusts downed power lines, tore a roof off of a building and overturned a truck trailer, according to press reports. Meanwhile, wintry conditions affected New England and Alaska. Snow accumulated as far east as Cape Cod, MA, and strong wind gusts combined with frigid Arctic air to produce bitter wind chills across much of the Northeast. In Alaska, nearly two feet of snow covered Valdez, AK, pushing the seasonal snowfall total to more than 23 feet, while temperatures plunged to -50°F in the eastern part of the state.

The week began with heavy rain in south-central Texas associated with a low in the western Gulf of Mexico. Up to 2.5 inches of rain soaked San Antonio, TX on Sunday. As the low slowly crept eastward, heavy rain spread into the lower Mississippi Valley, causing floods in parts of Texas, Louisiana, and Mississippi. Farther north, a storm system raced across the upper Midwest and Great Lakes, producing wintry conditions from Minnesota to New York. Up to 7 inches of snow blanketed Lutsen, MN while freezing rain glazed southern Michigan and northern Indiana, generating hazardous driving conditions. Elsewhere, ice jams caused flooding along the Cedar River near Colesville, IA. Farther west, unseasonably warm weather developed across the north-central U.S. Nearly half a dozen record daily highs were observed Tuesday from Montana to Minnesota as temperatures soared into the sixties as far north as South Dakota. Meanwhile, a cold front moved onshore in the Pacific Northwest, generating strong wind gusts and heavy rain along the coast and snow in the Cascades. In Alaska, heavy snow fell across the southern part of the state, with 16.4 inches burying Anchorage during the 26th–28th, the greatest 3-day total ever recorded in January and also the most snow cover (34 inches) at that location in 33 years.

During the last half of the week, the unusually warm conditions in the north-central U.S. expanded to engulf most of the northern and central Plains and portions of the Mississippi Valley. Numerous record daily highs were recorded as readings soared above 70°F from Montana to Missouri. In sharp contrast, wintry weather dominated the northeastern quarter of the country as a low moved across the northern Great Lakes and southeast Canada. Snow blanketed the Great Lakes, New England, and central Appalachians. Up to 5 inches of snow was measured at Elkins, WV while Lewiston, ME was buried under 8 inches. Cold Canadian was pulled southeastward out of Canada as the storm developed explosively near the Canadian Maritimes where some locations were buried under 2 to 4 feet of snow. Strong wind gusts combined with the cold air to produce bitter wind chills from the mid-Atlantic to northern New England. Farther west, heavy rain and high winds pounded the north Pacific coast. Nearly four inches of rain soaked Quillayute, WA on Wednesday while winds gusts over 70 mph and 25-foot waves battered the Oregon coast on Friday.

According to the River Forecast Centers, the greatest weekly precipitation totals (more than 2 inches) were measured from south-central and eastern Texas eastward along the Gulf Coast to southern Georgia, along the north Pacific coast, and at scattered locations in extreme southeastern Alaska (Table 1). Heavy rains have now drenched parts of the central Gulf Coast for four successive weeks (Figure 1). Light to moderate amounts were measured in the southern Plains, the lower half of the Mississippi Valley, the Deep South, the south Atlantic, most of Florida, the extreme eastern Ohio Valley, the central Appalachians, northern Maine, the central Rockies, northern California, and southern and parts of central Alaska. Little or no precipitation fell across the remainders of the Atlantic Coast, Northeast, and Ohio Valley, the Great Lakes, the upper half of the Mississippi Valley, the northern and central Plains, the northern and southern Rockies, the Southwest, the Great Basin, southern California, Hawaii, and the remainder of Alaska.

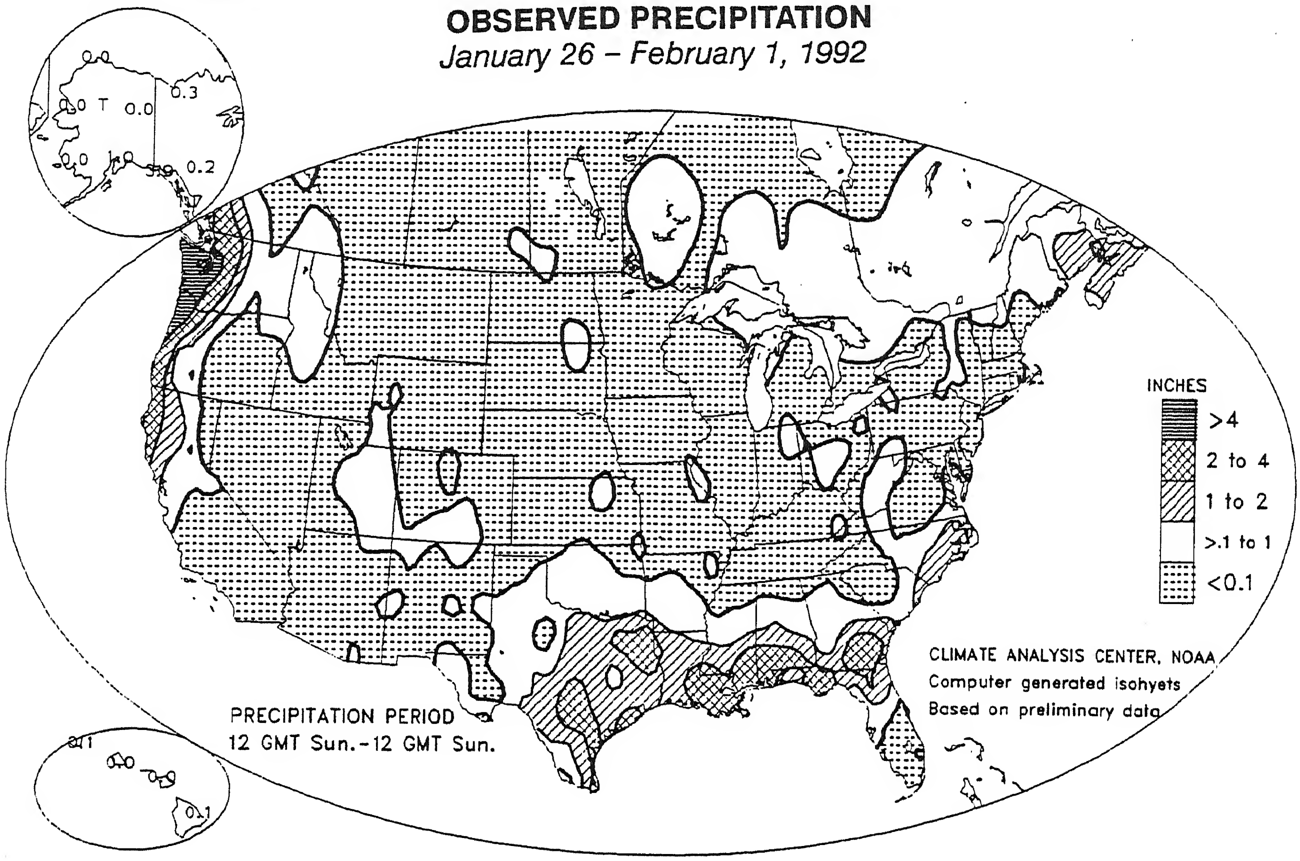
Unseasonably warm weather enveloped most of the contiguous U.S., with parts of the Great plains recording temperatures more typical of Spring (Table 2). Weekly departures between +20°F and +29°F were observed from eastern Nebraska to northwestern Montana, where readings soared into the sixties and seventies. Departures of +10°F to +19°F were reported from coastal Northwest eastward to the middle Mississippi Valley. Temperatures averaged between 4°F and 9°F above normal across the Great Lakes, portions of New England, the middle Atlantic, most of the Deep South, southern Florida, northern and central Texas, the Southwest, the Great Basin, and coastal southern California. In Alaska, unusually mild weather was confined to the Panhandle. Weekly departures reached +12°F at Juneau.

Unusually cold conditions were limited to portions of the middle and south Atlantic, extreme southern Texas, and scattered locations in the central Rockies (Table 3). Weekly departures of -4°F to -7°F were reported at scattered locations in southern Texas while the remaining aforementioned areas experienced near to slightly below temperatures. In Alaska, significantly colder weather was reported across most of the state. Readings dipped below -40°F across eastern and northern Alaska, producing weekly departures of -10°F to -20°F at several locations.

TABLE 1. *SELECTED STATIONS WITH 2.00 OR MORE INCHES OF PRECIPITATION DURING THE WEEK OF JANUARY 26 - FEBRUARY 1, 1992*

STATION	TOTAL (INCHES)	STATION	TOTAL (INCHES)
QUILLAYUTE, WA	9.02	APALACHICOLA, FL	2.59
ASTORIA, OR	5.12	PENSACOLA NAS, FL	2.32
SEATTLE-TACOMA, WA	4.39	NORTH BEND, OR	2.32
OLYMPIA, WA	4.36	EUREKA, CA	2.28
STAMPEDE PASS, WA	3.88	SITKA, AK	2.25
YAKUTAT, AK	3.88	LAFAYETTE, LA	2.23
SAN ANTONIO/KELLY AFB, TX	3.22	PORTLAND, OR	2.16
VALDEZ, AK	3.11	NEW ORLEANS NAS, LA	2.15
TACOMA/MCCHORD AFB, WA	3.00	PANAMA CITY/TYNDALL AFB, FL	2.09
WAYCROSS, GA	2.89	CORPUS CHRISTI NAS, TX	2.07
SAN ANTONIO, TX	2.78	SALEM, OR	2.01
SAN ANTONIO/RANDOLPH AFB, TX	2.75	NEW ORLEANS/MOISANT, LA	2.00
TACOMA/FT LEWIS/GRAY AAF, WA	2.69		

OBSERVED PRECIPITATION
January 26 – February 1, 1992



DEPARTURE OF AVERAGE TEMPERATURE FROM NORMAL (°F)
January 26 – February 1, 1992

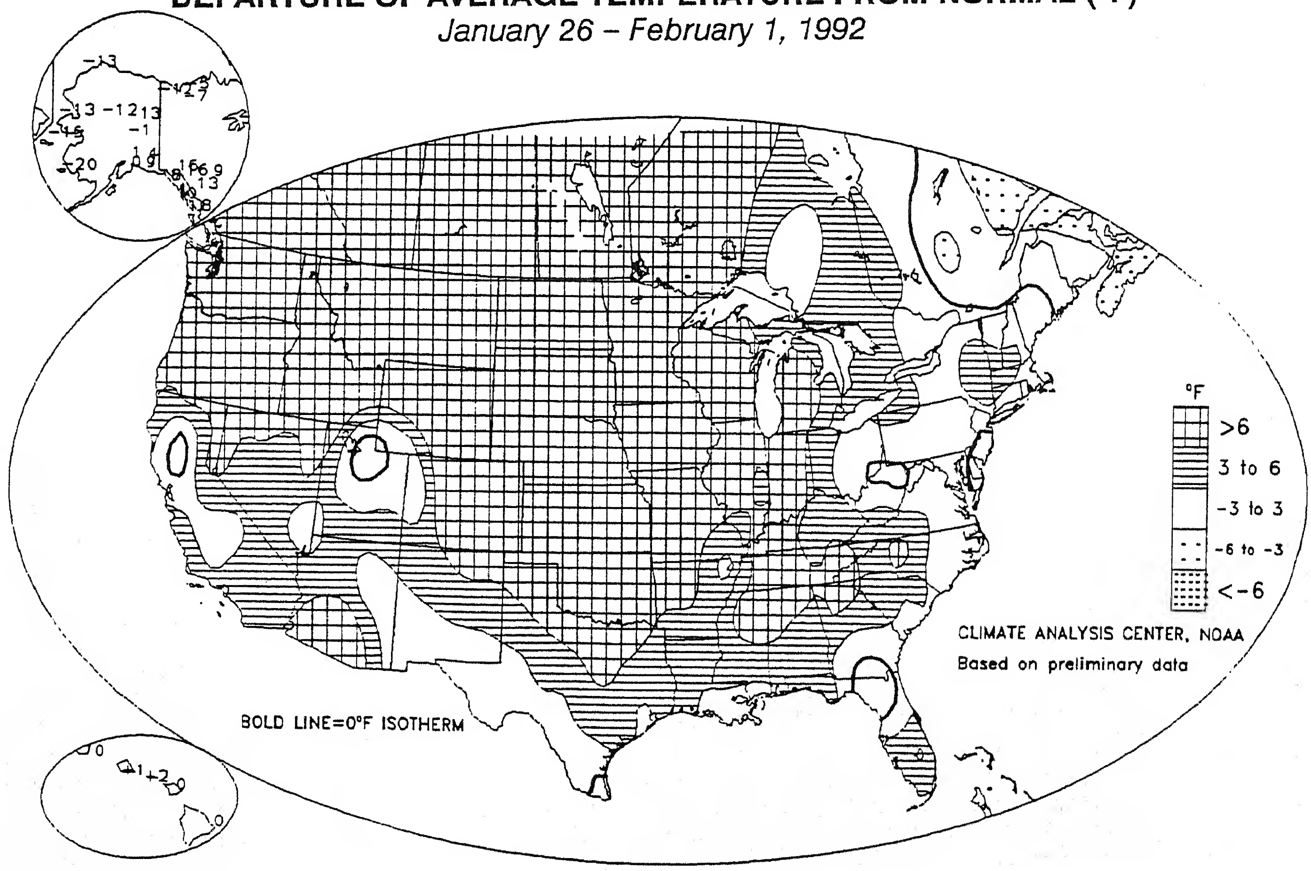


TABLE 2. *SELECTED STATIONS WITH TEMPERATURES AVERAGING 19.0°F OR MORE ABOVE NORMAL FOR THE WEEK OF JANUARY 26 – FEBRUARY 1, 1992*

STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
HAVRE, MT	+29.2	42.7	ABERDEEN, SD	+21.9	30.8
GLASGOW, MT	+27.5	36.6	WILLISTON, ND	+21.7	29.9
GREAT FALLS, MT	+25.5	46.5	DEVIL'S LAKE, ND	+21.3	25.8
MILES CITY, MT	+24.7	40.1	GRAND ISLAND, NE	+20.8	42.6
CUT BANK, MT	+24.6	40.8	GRAND FORKS, ND	+20.8	23.7
JAMESTOWN, ND	+24.6	30.8	PIERRE, SD	+20.4	36.3
BILLINGS, MT	+24.2	46.8	GILLETTE, WY	+20.3	42.2
DICKINSON, ND	+24.0	35.8	NORFOLK, NE	+20.3	38.8
MINOT, ND	+23.9	31.0	FARGO, ND	+20.2	25.3
BISMARCK, ND	+22.4	30.1	ALEXANDRIA, MN	+19.9	26.0
RAPID CITY, SD	+22.2	44.1	SIOUX FALLS, SD	+19.5	32.8
LEWISTOWN, MT	+22.2	41.5	SHERIDAN, WY	+19.0	40.2
HURON, SD	+22.1	34.2			

TABLE 3. *SELECTED STATIONS WITH TEMPERATURES AVERAGING 3.5°F OR MORE BELOW NORMAL FOR THE WEEK OF JANUARY 26 – FEBRUARY 1, 1992*

STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
BETHEL, AK	-20.0	-14.4	ST PAUL ISLAND, AK	-6.0	18.8
KING SALMON, AK	-19.9	-6.4	BIG DELTA, AK	-5.9	-9.5
ILIAMNA, AK	-17.3	-1.6	KINGSVILLE NAS, TX	-5.7	55.3
NOME, AK	-15.2	-9.7	DOVER AFB, DE	-5.1	30.2
KOTZEBUE, AK	-13.7	-16.8	ALBANY, GA	-4.6	46.9
BARROW, AK	-13.7	-29.8	REDDING, CA	-4.0	44.1
BETTLES, AK	-12.8	-22.1	GAINESVILLE, FL	-4.0	54.1
ALAMOSA, CO	-12.0	5.4	RED BLUFF, CA	-3.9	43.1
ANIAK, AK	-8.7	-6.9	EASTPORT, ME	-3.8	18.8
COLD BAY, AK	-6.8	21.1	SALT LAKE CITY, UT	-3.8	26.4
MCGRATH, AK	-6.5	-14.2			

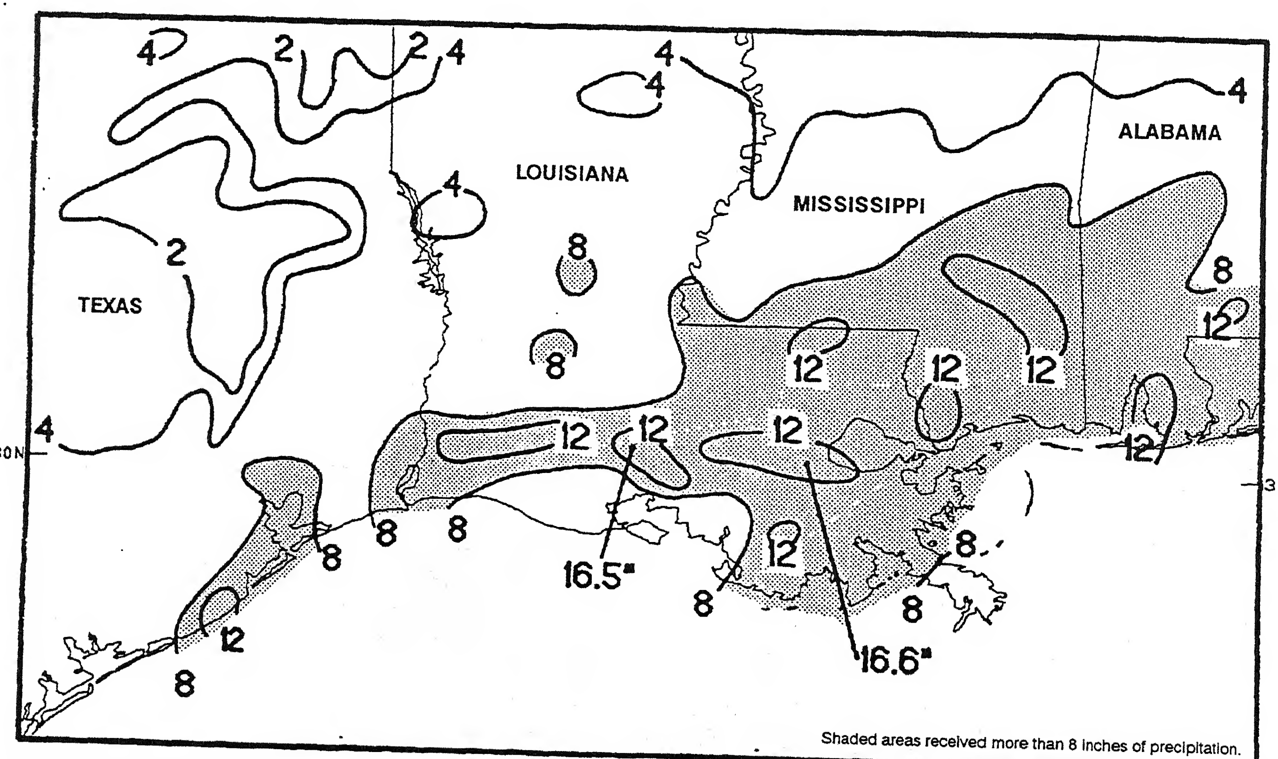
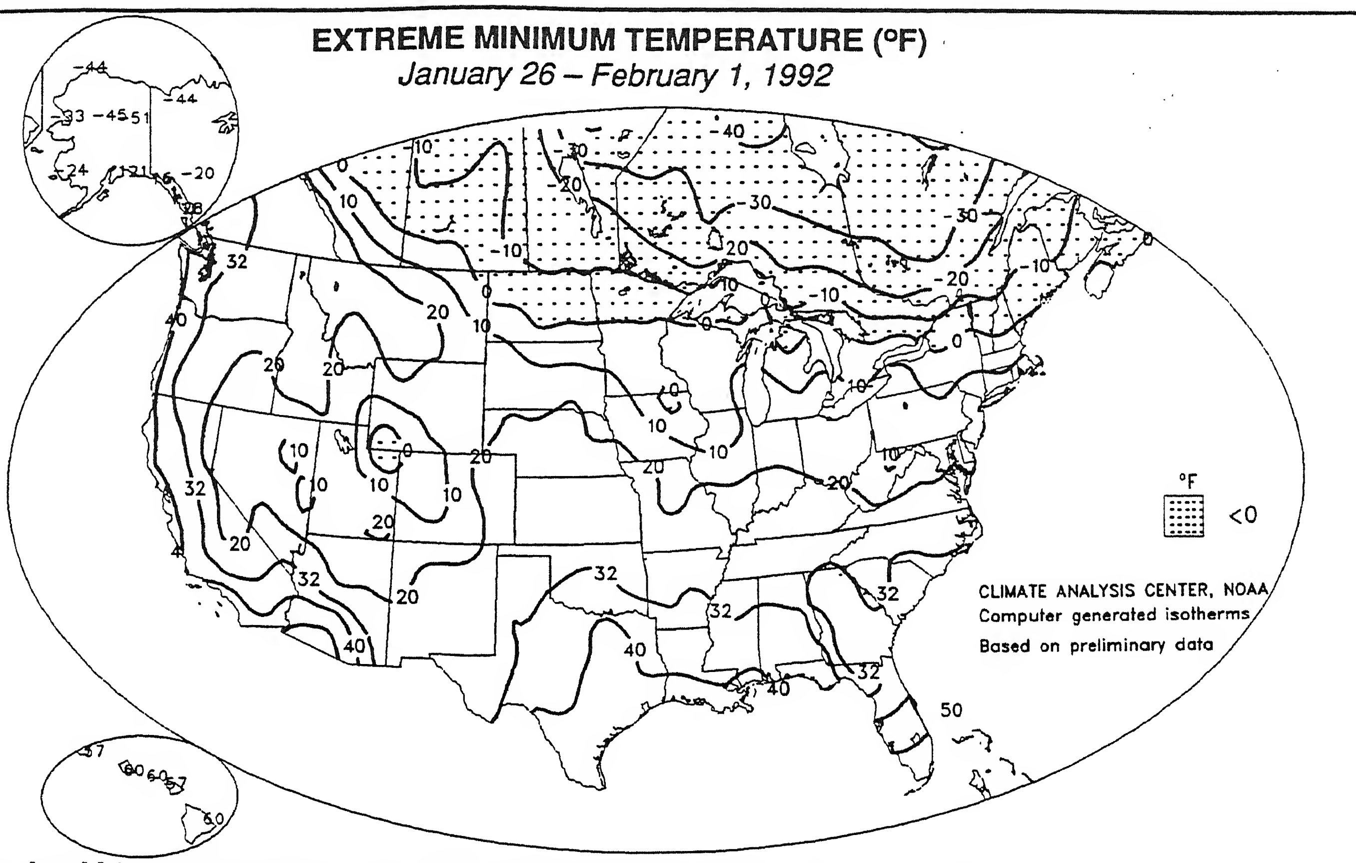


FIGURE 1. Total precipitation across the central Gulf Coast during January 5 – February 1, 1992, based on River Forecast Center reports. Isopleths are drawn for 2, 4, 8 and 12 inches. *1992 seems to have picked up where 1991 left off, with heavy rain observed across the central Gulf Coast. Some locations in the southern sections of Alabama, Mississippi, and Louisiana, where 80–105 inches of precipitation was recorded during 1991, have measured over a foot of rain since early January.*

EXTREME MINIMUM TEMPERATURE (°F)

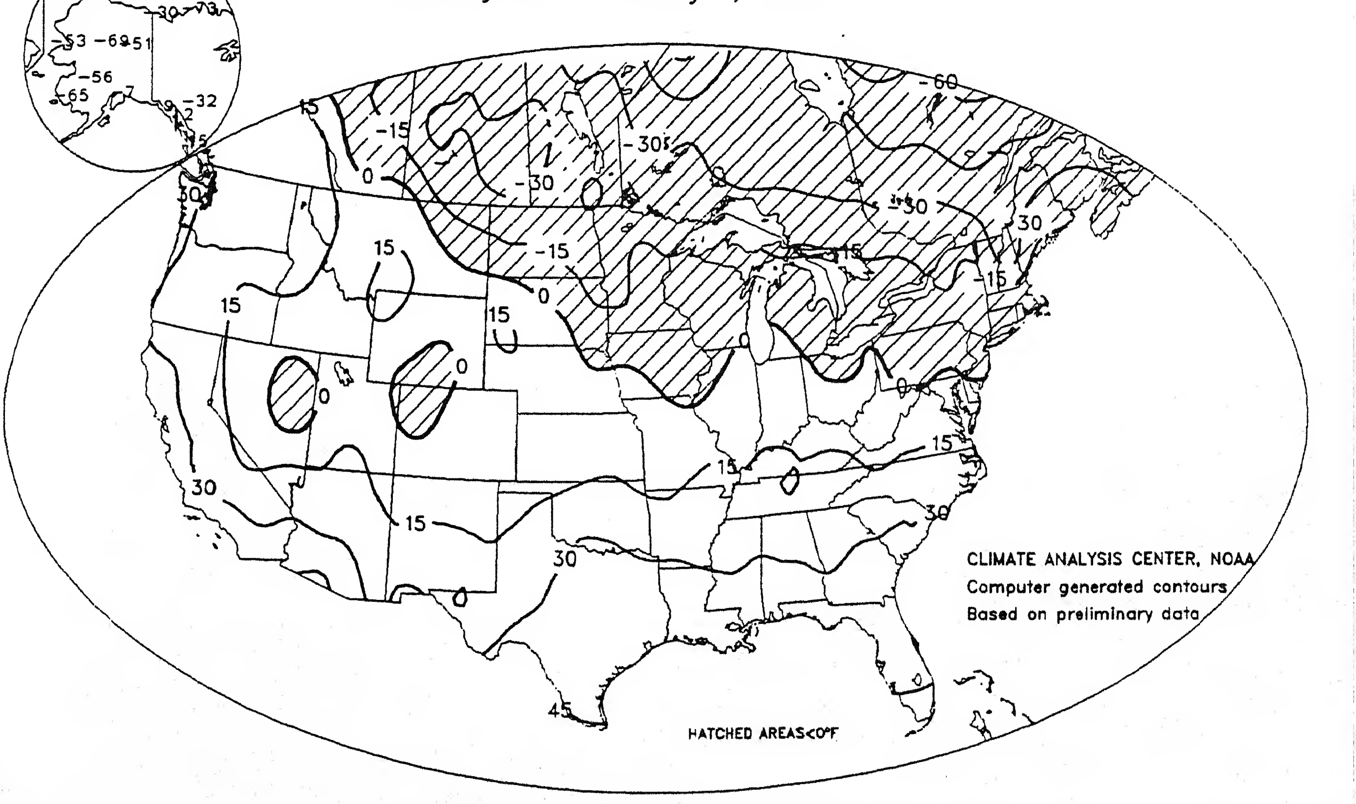
January 26 – February 1, 1992



Bitterly cold Arctic air remained north of the contiguous U.S. as subzero lows penetrated only as far south as the northern Great Plains, northern New England, and higher elevations of the central Rockies (top). Strong winds accompanied the cold across the northern tier of states, generating wind chills below −30°F in extreme northern New England (bottom).

MINIMUM WIND CHILL (°F)

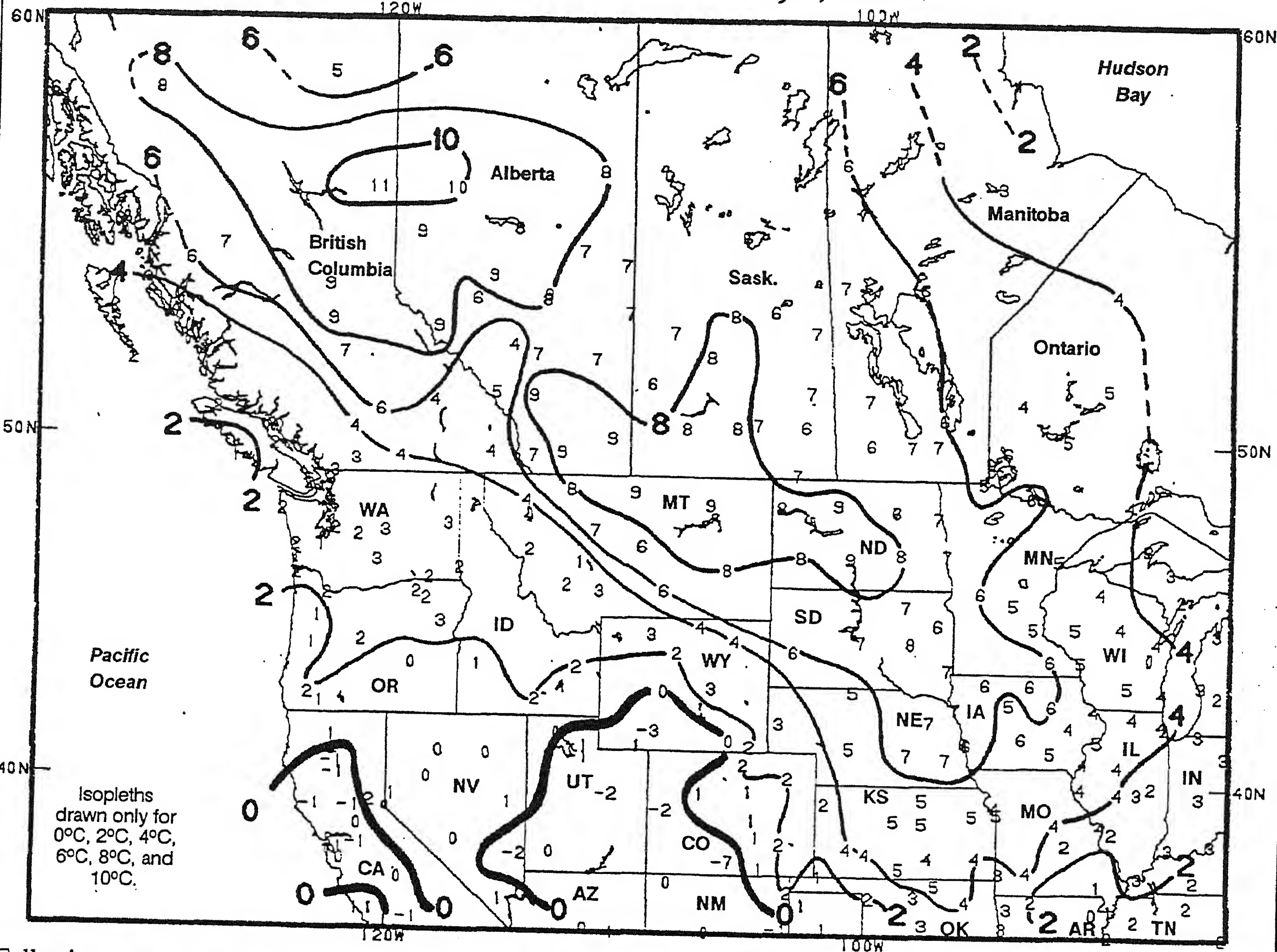
January 26 – February 1, 1992



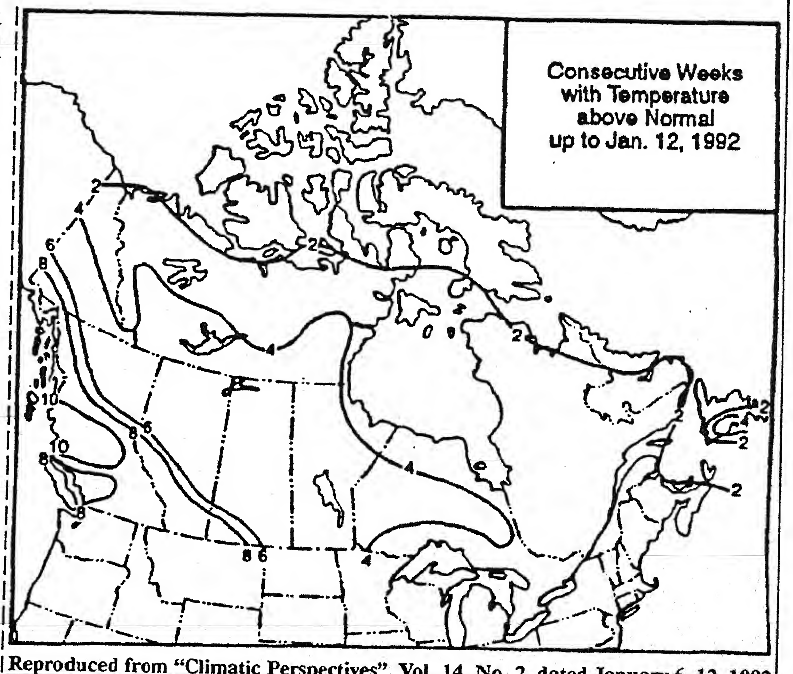
GLOBAL CLIMATE HIGHLIGHTS FEATURE

DEPARTURE OF AVERAGE TEMPERATURE FROM NORMAL (°C)

December 8, 1991 – February 1, 1992



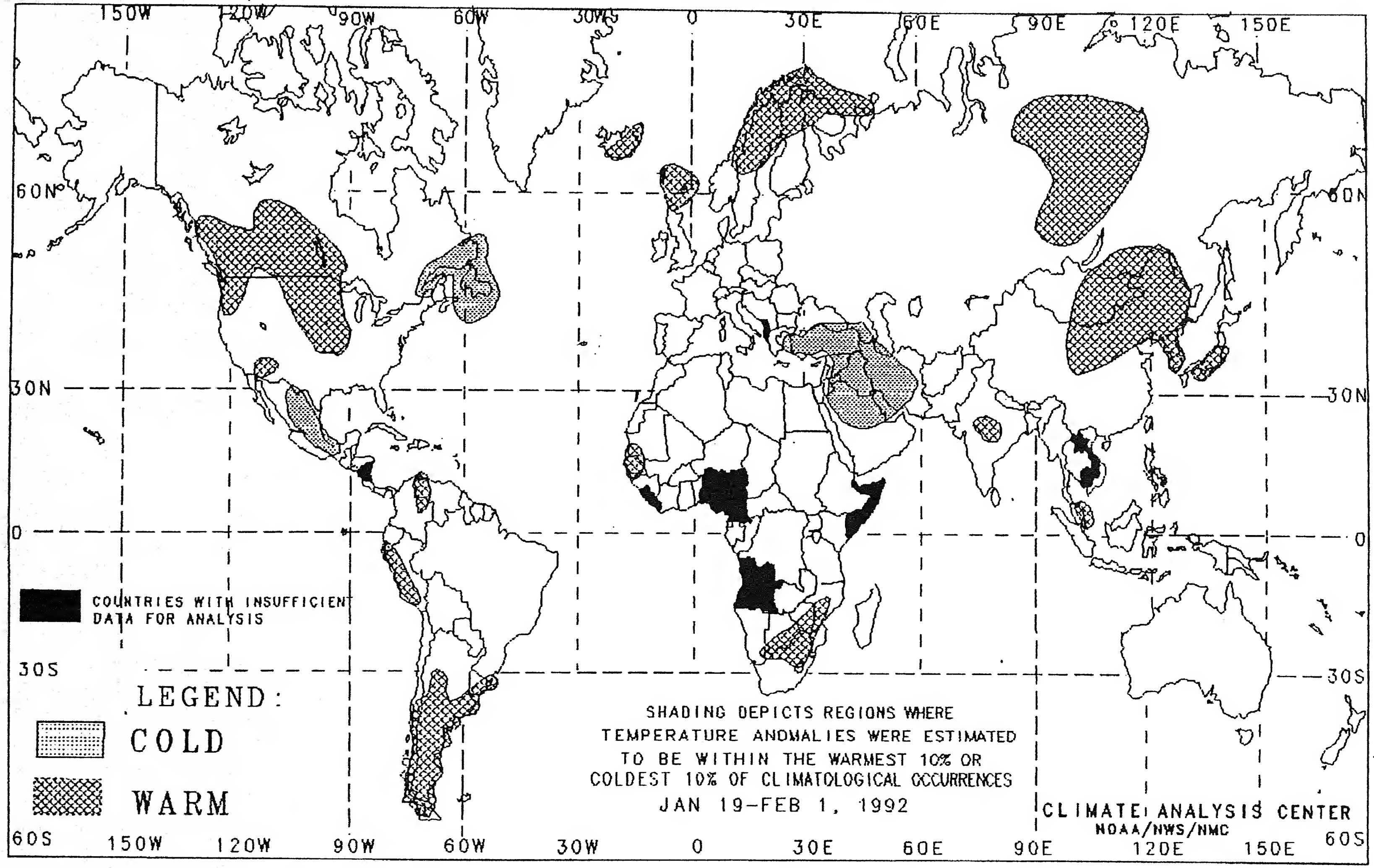
Following near to below normal temperatures in many areas during November, unseasonably mild conditions have remained entrenched across parts of the central and western U.S. and western Canada for more than two months. Temperatures have averaged 8°C to 11°C above normal from northern British Columbia southeastward into the Northern High Plains and Great Plains (top). As of January 12, 1992, portions of central and west-central British Columbia had experienced ten or more consecutive weeks with above normal temperatures, and most of Canada had been engulfed by abnormally mild weather for at least two consecutive weeks (right). This pattern of abnormal warmth corresponds well with a positive December – March temperature anomaly that is frequently observed from southern Alaska southeastward into the north-central U.S. during low-index (warm) ENSO episodes.



Reproduced from "Climatic Perspectives", Vol. 14, No. 2, dated January 6-12, 1992

2–WEEK GLOBAL TEMPERATURE ANOMALIES

JANUARY 19 – FEBRUARY 1, 1992



The anomalies on this chart are based on approximately 2500 observing stations for which at least 13 days of temperature observations were received from synoptic reports. Many stations do not operate on a twenty–four hour basis so many night time observations are not taken. As a result of these missing observations the estimated minimum temperature may have a warm bias. This in turn may have resulted in an overestimation of the extent of some warm anomalies.

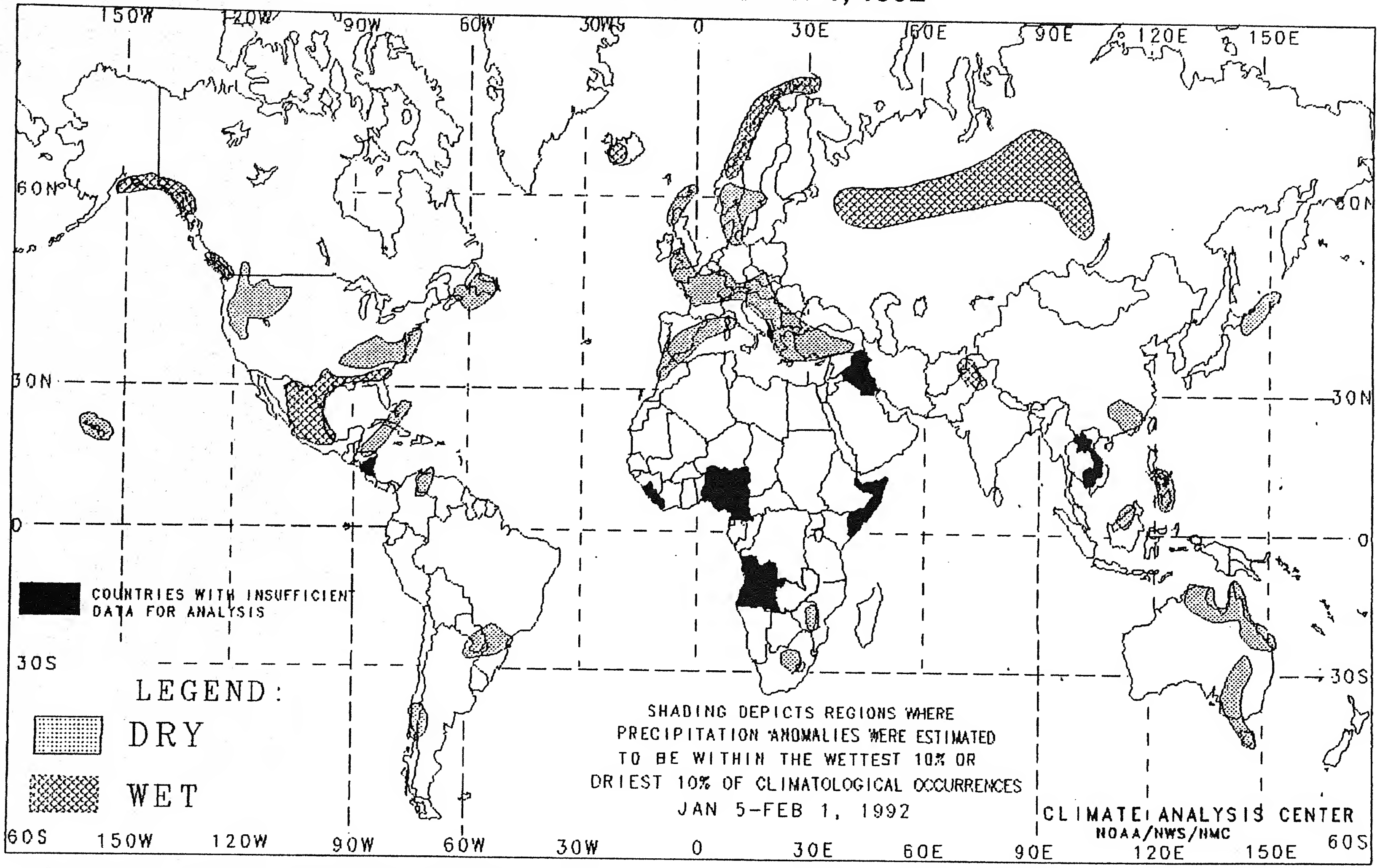
Temperature anomalies are not depicted unless the magnitude of temperature departures from normal exceeds 1.5°C.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

This chart shows general areas of two week temperature anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

4–WEEK GLOBAL PRECIPITATION ANOMALIES

JANUARY 5 – FEBRUARY 1, 1992



The anomalies on this chart are based on approximately 2500 observing stations for which at least 27 days of precipitation observations (including zero amounts) were received or estimated from synoptic reports. As a result of both missing observations and the use of estimates from synoptic reports (which are conservative), a dry bias in the total precipitation amount may exist for some stations used in this analysis. This in turn may have resulted in an overestimation of the extent of some dry anomalies.

In climatologically arid regions where normal precipitation for the four week period is less than 20 mm, dry anomalies are not depicted. Additionally, wet anomalies for such arid regions are not depicted unless the total four week precipitation exceeds 50 mm.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

The chart shows general areas of four week precipitation anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

SPECIAL CLIMATE SUMMARY

Western Regional Climate Center, Reno, NV
Contact: K. Redmond Phone: (702) 677–3139

Information compiled from:

Soil Conservation Service, Bureau of Reclamation, State Climate Offices, California Dept. of Water Resources, National Climatic Data Center, and Press Reports

and

Analysis and Information Branch
Climate Analysis Center, NMC
National Weather Service, NOAA

UPDATE ON THE 1991–92 RAINY SEASON IN THE FAR WEST

Like a broken record, the lack of normal precipitation in the Sierra Nevadas continues to be the dominant climate anomaly in the western U.S. as the California drought persists unabated for the sixth consecutive winter season. This new state of affairs has intruded upon the consciousness of the affected inhabitants to such an extent that a year with 30–50% of average snowpack, the source of next year's water, is regarded as welcome news. The corresponding figure for last year at this time was about 15%.

Even before the usual commencement of the 1991–92 rainy season in the Far West, there were several noteworthy weather and climate–related events that affected the area. During the Summer, California was faced with the worst fire threat in its history due to the five–year drought, related insect damage that killed some ten million trees statewide, winter freezes that killed low–lying shrubs and plants, and March rains that brought up thick layers of grass that had dried out. Fortunately, unusually cool and humid weather dominated much of the state during the summer, producing one of the mildest fire seasons ever into mid–October. Fires on California's non–federal lands had burned only 16,833 acres through the first ten and a half months of 1991, or less than 15% of the average at this date. The situation

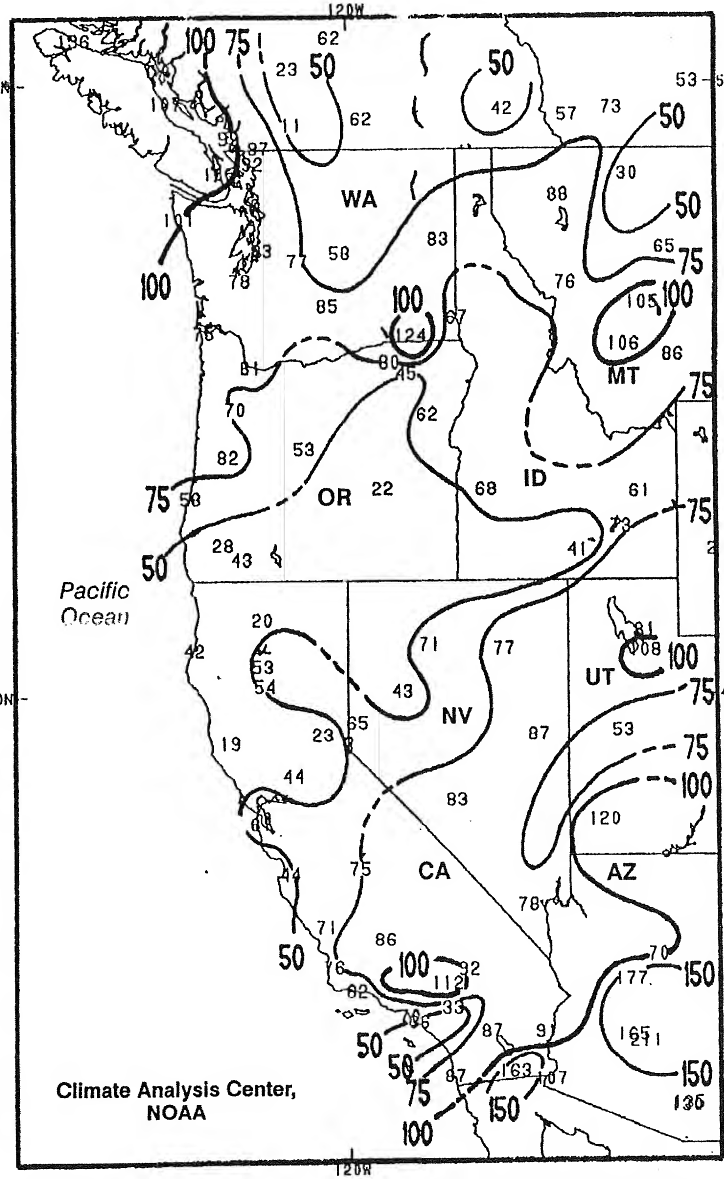


FIGURE 1. Percent of Normal Precipitation during October 1, 1991 – February 1, 1992. Isopleths drawn only for 50%, 75%,

were blackened, five lives were lost, over a 100 homes were destroyed, and hundreds of people were evacuated. Particularly hard-hit was Spokane, WA, where a total of 34 fires charred 43,000 acres around the city. On a state-wide basis, Montana reported the largest acreage burnt (over 200,000) from twenty different fires. Portions of Oregon, Idaho, and Wyoming were also affected, but to a much lesser degree than Montana and Washington. Late in the month, most of the wild fires were brought under control as favorable weather conditions aided firefighters; however, farther south, the tranquil fire season in California abruptly ended on October 20.

In the exclusive hills above San Francisco Bay, a firestorm, whipped by 30 mph dry Santa Ana winds, temperatures in the nineties, and tinderbox conditions, destroyed more than 3,000 homes and apartments, took 25 lives, injured 148 people, burnt 1,800 acres, and caused an estimated $1.5 to $2 billion in damages in the Oakland–Berkeley area. The firestorm was brought under control 17 hours after it started, and heavy rains a few days later extinguished any smoldering areas, but raised the threat of mudslides on the denuded hills.

In early December, winds gusting up to 60 mph picked up large amounts of loose soil from parched fallow fields, creating a blinding duststorm on Interstate–5 near Coalinga, CA. The resulting duststorm caused the nation's worst interstate highway pile-up that involved 93 cars and 11 tractor–trailers that took 17 lives and injured over 150 people. Local officials believed that the state's longest recorded drought, now entering its sixth consecutive year, had added to the problem by leaving the soil unusually dry and light.

An auspicious start to the snowfall season in October and early November allowed many ski areas to celebrate their earliest openings in nearly a decade. Since then, however, the atmosphere has failed to supply significant precipitation to this area.

For the past two months, storm systems approaching the Pacific Coast have been shunted to the north or the south [Figure 8]. The northerly branch of the storm track has been over the Pacific Northwest (although still less than normal), and especially the panhandle of Alaska. Yakutat has racked up impressive precipitation totals throughout the fall and winter, ending the year with about 220 inches, while Valdez, AK reported over 275 inches of snow thus far. Meanwhile, the southerly branch of the storm track has crossed southern California and northern Mexico. A succession of slow–moving cutoff low pressure centers embedded in this southerly branch has brought surplus precipitation to Arizona, New Mexico, Texas, northern Mexico, and occasionally southern California. Storms approaching central California have been

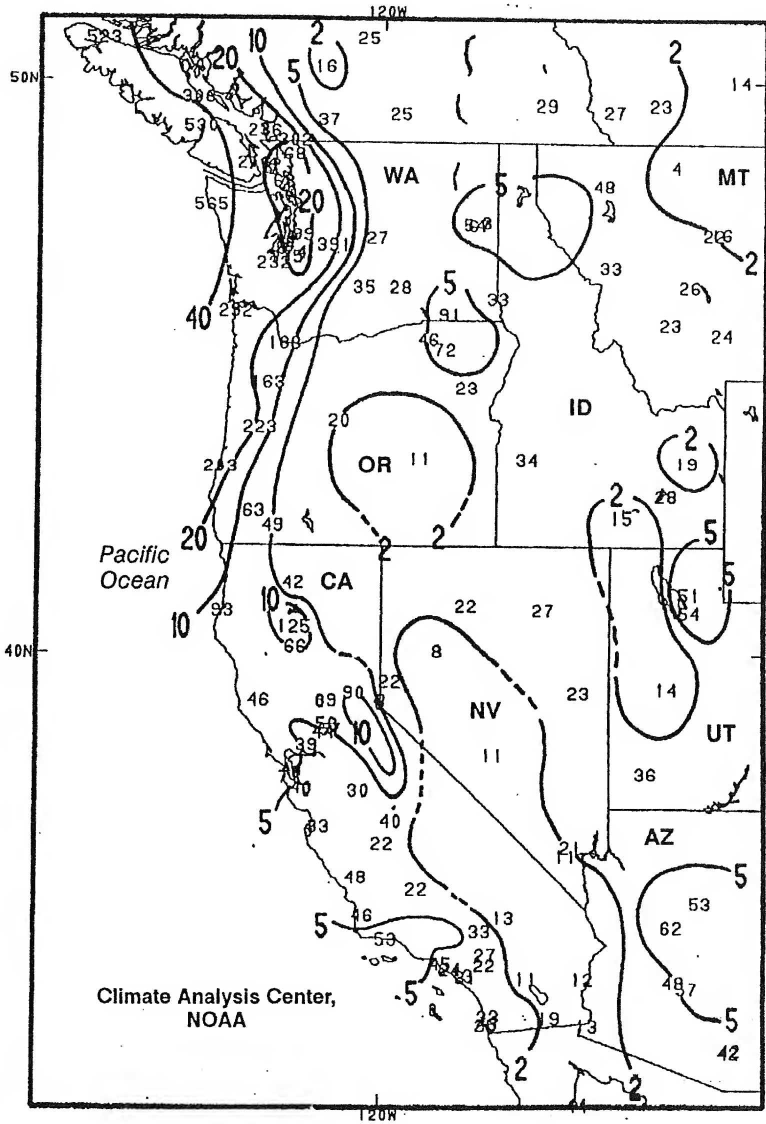


FIGURE 2. Total Precipitation during October 1, 1991 – February 1, 1992. Isopleths drawn only for 2, 5, 10, 20, and 40 inches. *Fewer than 2 inches of precipitation have dampened portions of the central and southern Intermountain West and northern and central Rockies. In sharp contrast, areas of coastal Oregon, western Washington, and southwestern British Columbia, which are typically wetter, have received 20 – 57 inches.*

torn apart where this "split flow" diverges, leaving weak and disorganized storms over the Sierras.

A few of the storms taking the southerly track have brought heavy (and even briefly excessive) precipitation to the coastal mountains, where water usage is derived from local sources. Indicative of the dry soils, some of the heavier early season precipitation events produced almost no added run-off.

January precipitation in the central Sierra Nevadas was generally 5-25% of average. Precipitation there since July has been about 60% of average. Squaw Valley reported only 7 inches of snow last month (normal is 52 inches). Snow water content is about 30-40% of average in the Tahoe Basin. The southern Sierra has been slightly more favored, with snow water content just under 50% of average. Despite the dry winter, ski areas are doing much better than previous years because of the early start and the widespread installation of snow making machinery as insurance.

Throughout the remainder of the Far West, precipitation since October 1 has similarly been below normal, with a large portion of the region observing less than 75% of normal [Figure 1]. Only extreme southeastern and northwestern sections of the region have recorded surplus precipitation during the past four months, with accumulated totals depicted in Figure 2.

Lake Tahoe has continued to fall, and sets new records for lowest elevation almost daily. Recently, the gauging station bottomed out when the lake reached 20 inches below the rim, and temporary measures are being taken to measure below a level it was thought the lake would never reach. At this time last year, the lake was about 16 inches below the rim. The water level never reached the rim last year, the first such year in historical records, and will likely not do so this year either. The water must drop another 1625 feet, however, before the lake is dry.

For the first three months of Water Year 1992 (starts October 1, 1991), statewide run-off in California has been 25% of average, compared with 20% last year. As expected, the below average run-off corresponds well with statewide subnormal precipitation since July 1 [Figure 3] (and from several years of drought). Reservoir storage at the start of January in California stands at 57% of average, compared with 54% last year. This increase is due largely to the "Miracle March" of 1991 [see Weekly Climate Bulletin #91/13, pages 9-14]. In each of the last five winters, at least one spring month (March-May) has brought wet conditions, and the past three springs have each had one exceptionally wet month: March 1989, May 1990, and March 1991. There has thus developed an expectation/hope that the state will once again be partially bailed out of a jam by yet another highly unlikely month later this year.

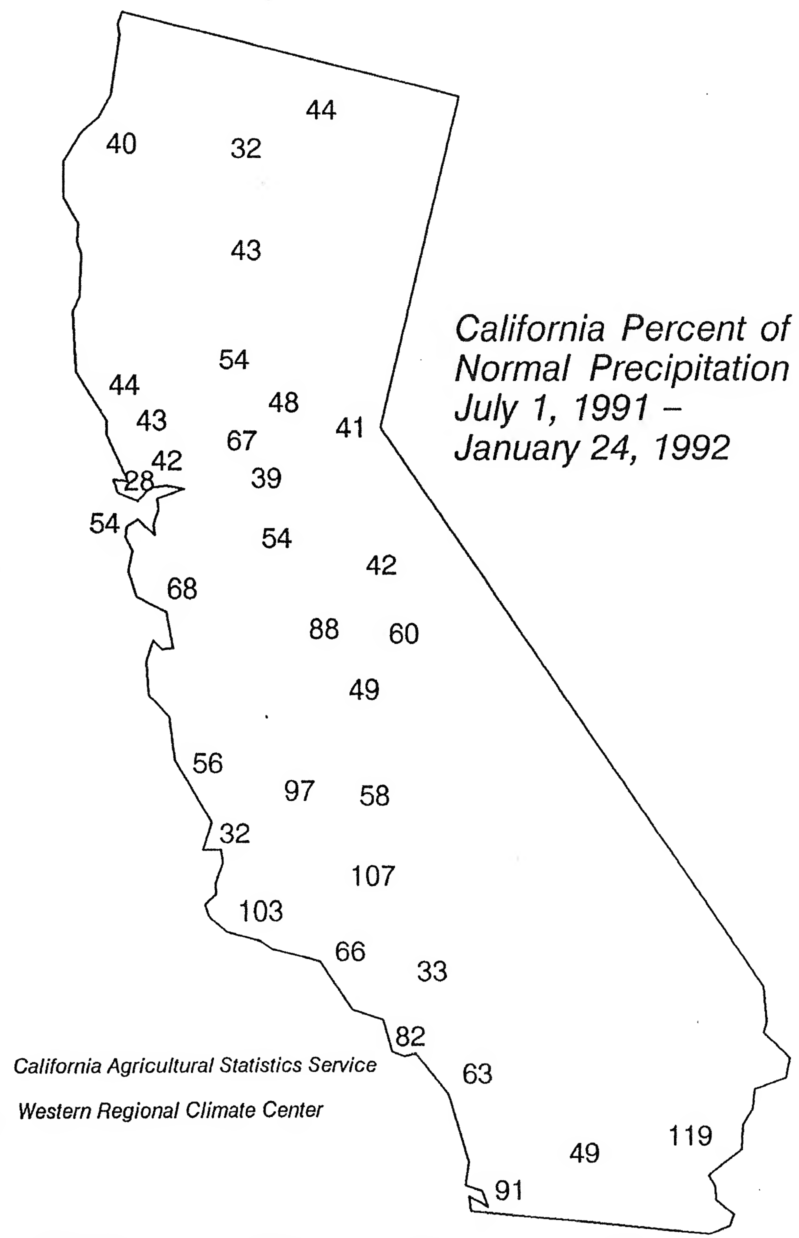


FIGURE 3. Percent of Normal Precipitation, July 1, 1991 – January 24, 1992, as compiled by the California Agricultural Statistics Service and the Western Regional Climate Center. *This has been an exceptionally dry period statewide, except for a few southern locations. Many areas in northern and central California have received under half of normal precipitation.*

The California Department of Water Resources has furnished values used in Table 1. Numbers are from the "Eight-Station Index" based on 8 climate stations in the Sacramento River drainage. On average, the period November–May brings 95% of the ANNUAL total precipitation, and the period November–March brings about 77% of the ANNUAL total. Statewide figures for Water Year 1992 are through December 31.

Preliminary water allocation decisions for the upcoming summer in California will be made in mid–February. With reservoir storage near one–half the average, a series of planning meetings in Autumn 1991 indicated that without an extremely wet winter, water shortages would be likely. Much of the Far West greatly depends upon precipitation that falls during the cool season (October–April). Across most of California, this 7–month period accounts for over 90% of its typical annual precipitation [Figures 4 and 5], with January normally the wettest month of the year. By February 1, the precipitation season is approximately 55–60% over in northern California and 50% over in southern California, so there is still some opportunity for improvement.

A short and long–term historical perspective of California precipitation is depicted in Figures 9 and 10. In Figure 9, the monthly observed and normal statewide precipitation amounts since 1982 are shown, demonstrating surplus totals during the early 1980s, near average values in the mid–1980s, and a consistent lack of normal precipitation since late 1986, with the exception of a few abnormally wet spring months. During the first half of the California rainy season (Sep–Jan), precipitation has generally been well below normal since the mid–1980s, adding extra burden on the latter half of the rainy season (Feb–May) to make–up the accumulated fall and early winter deficits [Figure 10].

California, however, is not the only state affected by dryness. Snowpack is below average in all western states except New Mexico and Arizona [Table 2], and has lagged increasingly behind average in most locations. Several areas have especially low reservoir storage as a result of drought in the previous 1–3 years [Figure 7]. These areas include eastern Oregon, parts of central and southern Idaho, Nevada, southern Utah, and portions of the upper Colorado Basin. Many reservoirs in the Great Basin are at less than 20–25% of capacity, and summer shortages are anticipated. Reservoir storage in Nevada is very close to zero. In rough terms, reservoirs are normally about half full at this time of the year to catch spring snowmelt and act as a safety cushion for floods if they materialize.

In Oregon, Crater Lake National Park had only 47 inches of snow on the ground at the end of January (average is 97 inches). The highest snow water content was

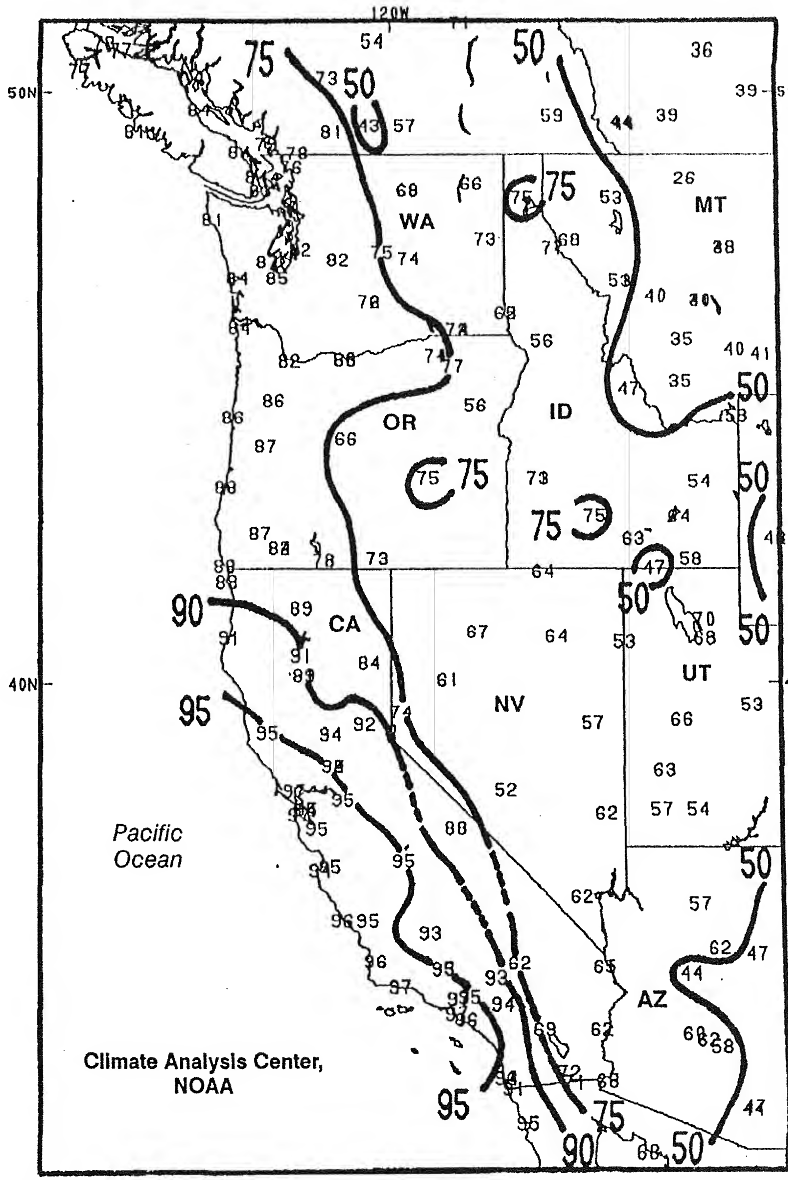


FIGURE 4. Percent of Normal Total Precipitation that Typically Falls during October – April. Isopleths are drawn only for 50%, 75%, 90% and 95%. *If precipitation were evenly distributed throughout the year, then 58.3% of the annual total precipitation would usually fall during October – April, which is 58.3% of the year (7 months out of 12). Across most of the Far West, however, a pronounced precipitation maximum is observed during these seven months, with daily normals peaking around mid-winter. This effect is most pronounced across California, where most locations normally receive 90 – 97 percent of annual rainfall during October – April.*

found at Mt. Rainier Paradise, with 42.3 inches (average is 44.4). The highest precipitation since October 1 was nearby at June Lake on Mt. Saint Helens, with 65.1 inches (average is 90). For an overall perspective of the percent of normal snow water content and precipitation since July 1, 1991 in the Far West, refer to Figures 11 and 12, respectively.

Reservoirs in Montana, Washington, Colorado, and Utah are generally sufficiently full to meet most needs. After a series of dry winters, Lake Powell on the Colorado River contains only 56% of capacity, and Lake Mead just downstream a few hundred miles contains 75% of capacity. Water supplies are in the best shape in New Mexico and Arizona, with good carry-over from last year and a deep snowpack.

This pattern of winter dryness in the northern portion of the West and wetness in the southern portion has been closely associated over the past 60 years with the presence of El Nino. This relationship is now incorporated into operational summer streamflow forecasts issued by the Soil Conservation Service for the western United States [Figure 6]. A dividing line, indicating a change of phase, extends from the central Sierra Nevadas eastward through northern Colorado, where no relationship exists. El Nino is also associated with warm winters in the Pacific Northwest and coastal California, and cool winters in the southeastern part of the western U.S. (K.T. Redmond and R.W. Koch, Water Resources Research, Vol. 27, No. 9, pp. 2381–2399).

January was a very warm month in the Pacific Northwest, both in an average sense and also with regard to extreme values. Glasgow, MT exceeded its previous warmest January of 1919 with an average temperature of 26.6°F, or 18.2°F above normal while January's average temperature at Havre, MT was nearly 20°F above normal. Miles City, MT reached 72°F on Jan. 31, just 1°F below the state record of 73°F set in 1919 at Bridger. Seasonal heating degree day departures reflect the mild winter in the northern portion of the West. Conversely, cool weather has prevailed in parts of the Southwest. Winslow, AZ remained under 50°F from November 29 until January 30, a total of 64 days, exceeding the previous longest such period (in 1967–68) by 3 days.

One effect of the high pressure at upper levels and light surface winds has been the widespread presence of fog in many of the basins in the West: the Columbia River Basin in eastern Washington, the tule fog in central California, the Snake River on occasion, and a few other locations. Aside from the psychological effects of cold, moist, and sunless days, pollution levels rise and automobile accidents frequently occur, as already demonstrated this Winter in central California.

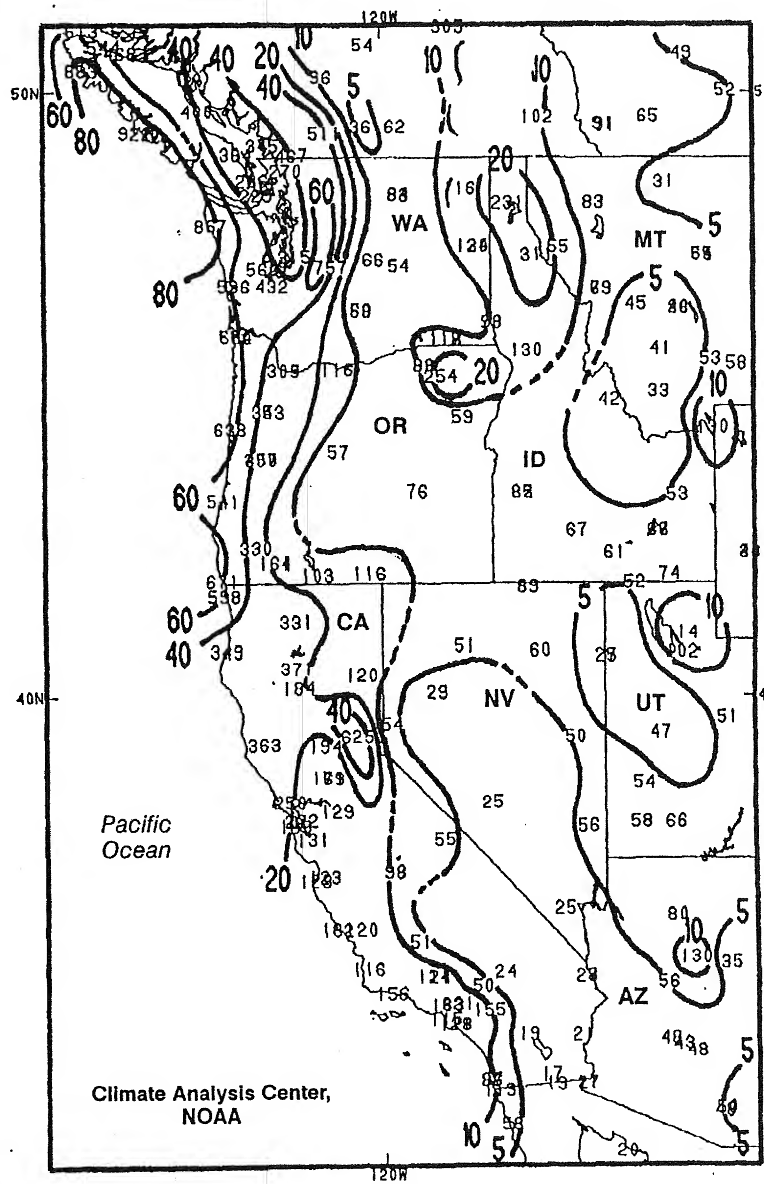


FIGURE 5. Normal Total Precipitation, October –April. Isopleths drawn only for 5, 10, 20, 40, 60, and 80 inches. *While fewer than 5 inches of precipitation typically dampen the desert Southwest, much of the Great Basin, and portions of the Intermountain West, coastal sections of the Pacific Northwest and southwestern Canada are normally deluged by 40 to 85 inches during this seven–month period.*

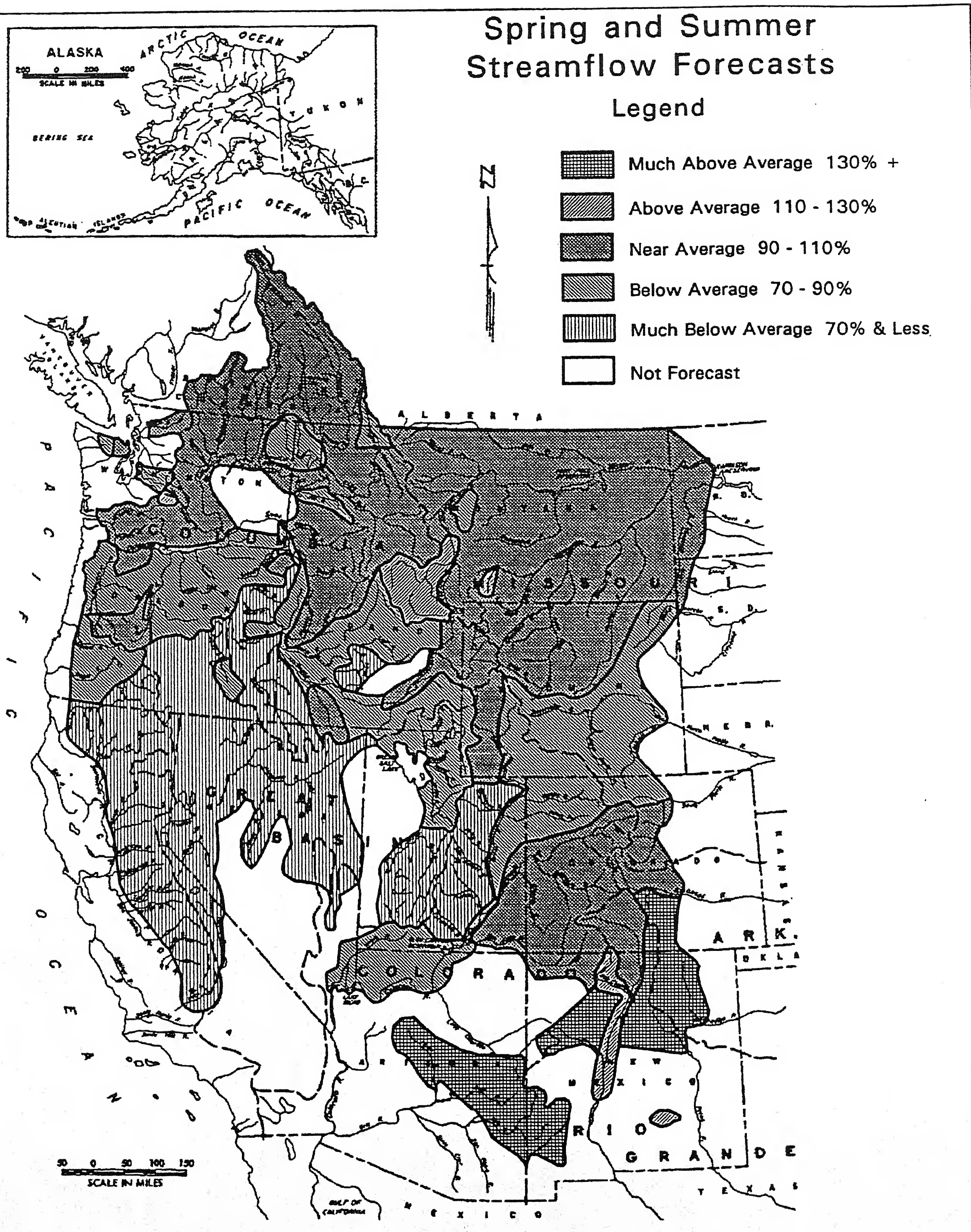


FIGURE 6. Spring and Summer Streamflow Forecasts as of January 1, 1992, taken from the Water Supply Outlook for the Western United States, a publication of the Soil Conservation Service and the Portland, OR WSFO. *Much of southern Oregon, the Sierra Nevadas, the northern Great Basin, and Utah are expecting much below normal streamflows during the next several months while more typical streamflows are anticipated across the northern and eastern tiers of the region.*

TABLE 1. WATER YEAR	STATEWIDE PERCENT OF AVE PRECIP	RUNOFF	NUMBER OF MONTHS WITH ABOVE AVERAGE PRECIPITATION NOV-MAY	NOV-MAR	SPRING RELIEF
1987	61	45	1 of 8	1 of 5	MARCH (WET)
1988	82	47	3 of 8	1 of 5	APRIL, MAY (WET)
1989	86	50	2 of 8	2 of 5	MARCH (VERY WET)
1990	69	45	2 of 8	1 of 5	MAY (VERY WET)
1991	76	40	2 of 8	1 of 5	-MARCH (VERY WET)
1992	65	25	1 of 4 (so far)	1 of 4	?????????
TOTAL			11 of 44	7 of 29	

TABLE 2. AREA	1991-1992 SNOW WATER CONTENT PERCENT OF AVERAGE				PRECIP PCT OF AVE SINCE OCT 1, 1991
AS OF:	DEC 23	DEC 30	JAN 13	JAN 30	JAN30
STATES					
ARIZONA	133	123	157	125	111
CALIFORNIA	58	55	47	38	48
COLORODO	110	98	95	83	86
IDAHO	106	93	75	72	75
MONTANA	119	107	90	93	89
NEVADA	68	64	65	55	63
NEW MEXICO	182	174	176	139	123
OREGON	74	63	61	52	78
UTAH	75	69	70	60	71
WASHINGTON	96	86	80	83	85
WYOMING	106	96	81	75	76
WEST REGION (except most of CA)	**97**	**87**	**78**	**72**	**79**
RIVER BASINS					
ARKANSAS BASIN (HEADWATERS)	138	123	108	91	98
COLORODO BASIN	96	87	83	72	78
COLUMBIA BASIN (USA ONLY)	97	84	74	71	79
MISSOURI BASIN	115	104	91	87	85
RIO GRANDE BASIN	156	143	145	113	104
THE GREAT BASIN	64	60	57	48	60

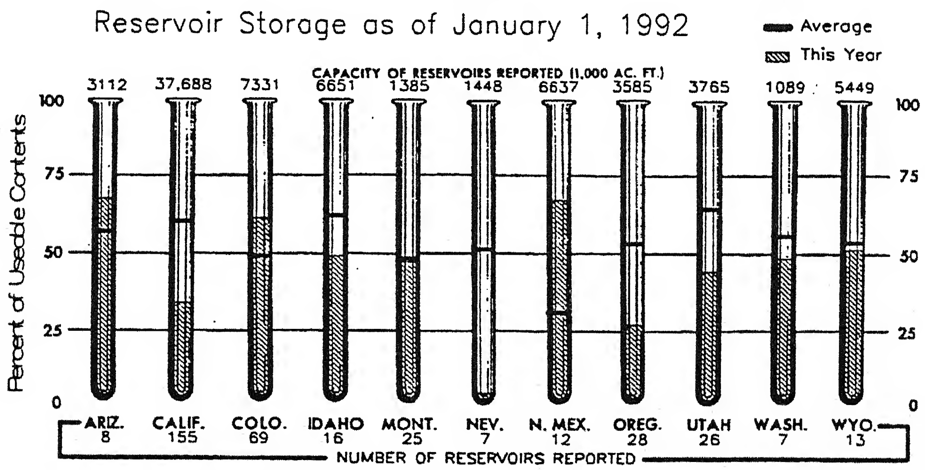
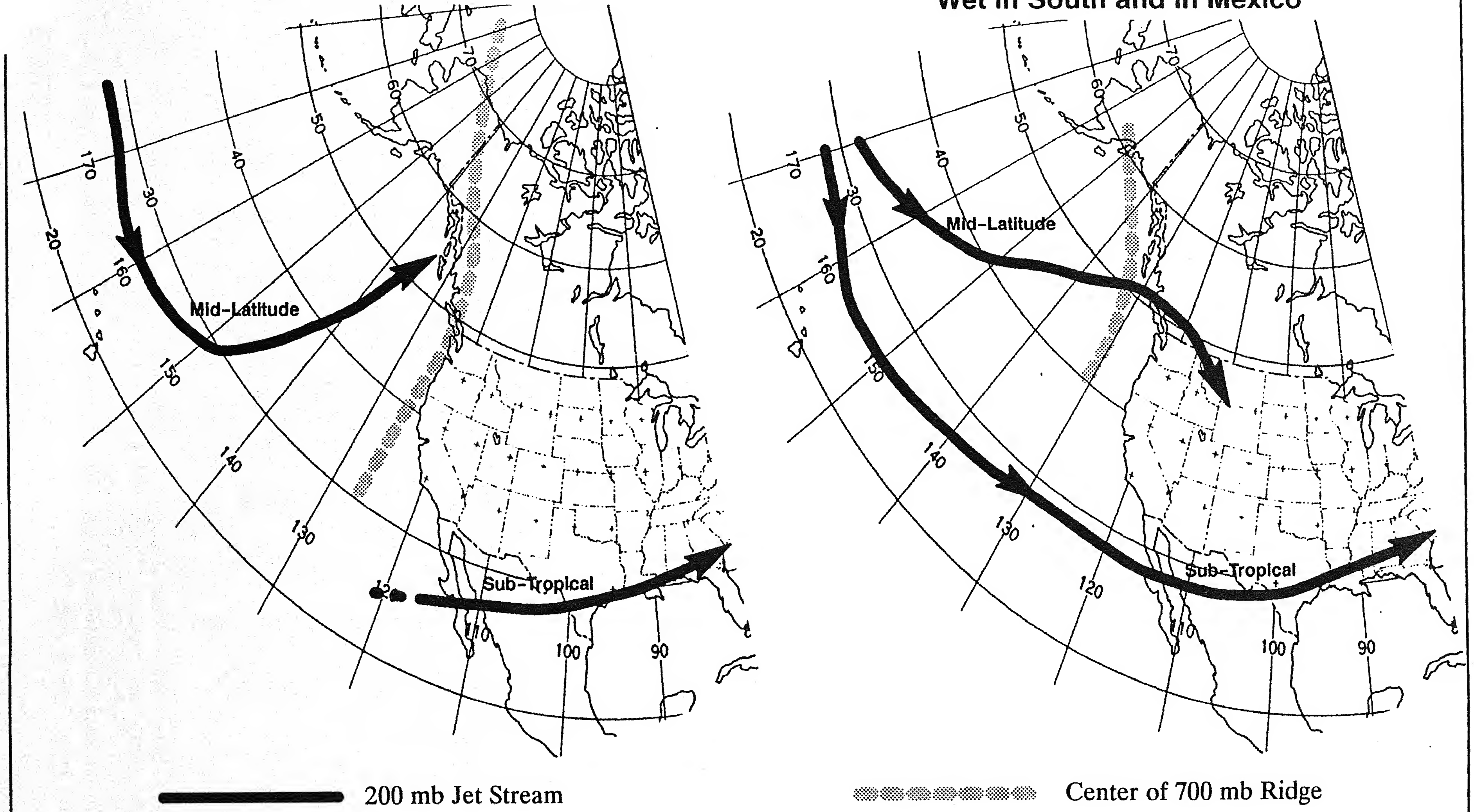


FIGURE 7. Statewide Reservoir Storages as of January 1, 1992, taken from the Water Supply Outlook for the Western United States, a publication of the Soil Conservation Service and the Portland, OR WSFO. *Most states in the central and southern Rockies had above normal reservoir storages as of the beginning of the year, but levels remained unfavorably low farther west. Reservoirs in both Oregon and California were at approximately half of typical levels while exceedingly low storages were observed across Nevada.*

1) High Pressure Ridge over West Coast: Mild and Dry Weather in California

2) Split Flow Pattern in the West: Typically Mild and Dry in Central; Wet in South and in Mexico



Climate Analysis Center, NOAA

FIGURE 8. Examples of the two upper-level flow regimes that have been dominated the eastern Pacific Ocean and western North America during the past six winters. Both patterns preclude primarily dry weather across northern California. but the full-latitude 700 mb ridge depicted in example 1 also keeps southern California dry while the split flow pattern (example 2) brings Pacific moisture and precipitation into the region.

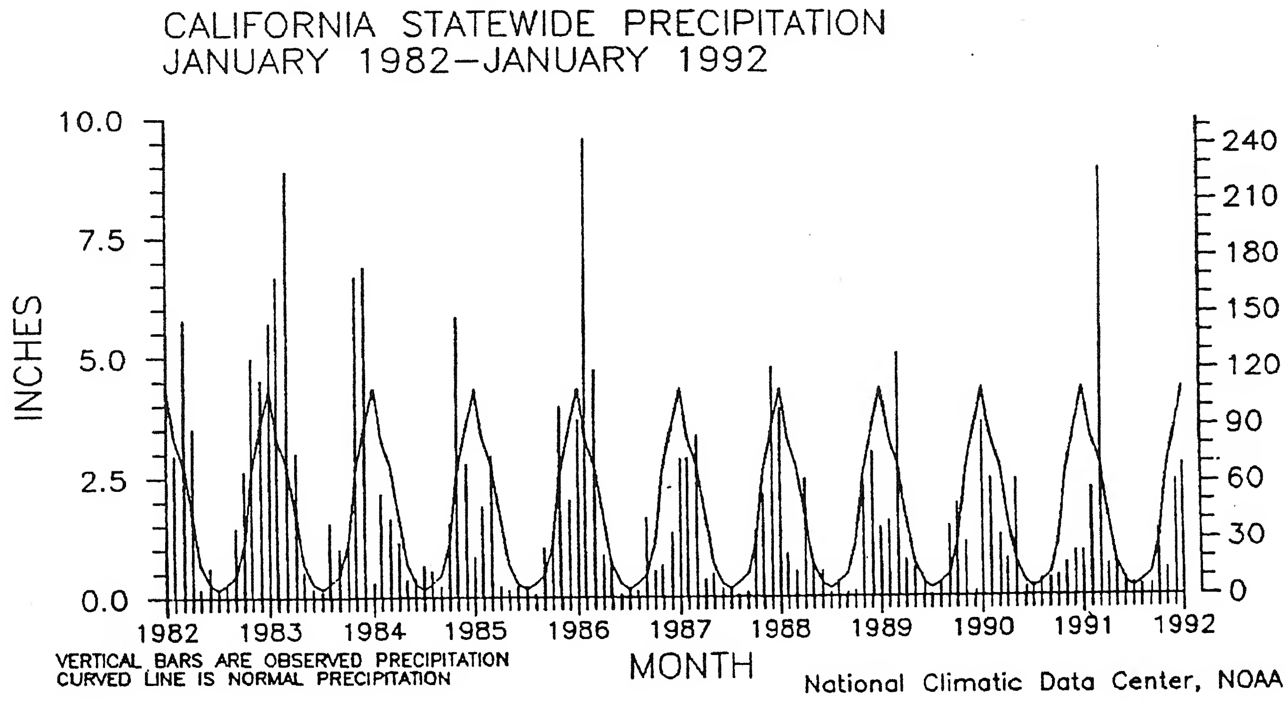


FIGURE 9. California Statewide Precipitation, January 1982 - January 1992, as computed by the National Climatic Data Center. *January 1992 was drier than normal across the state despite being the second–wettest month since January 1990 (last year's "March Miracle" was California's third wettest month in the last 10 years).*

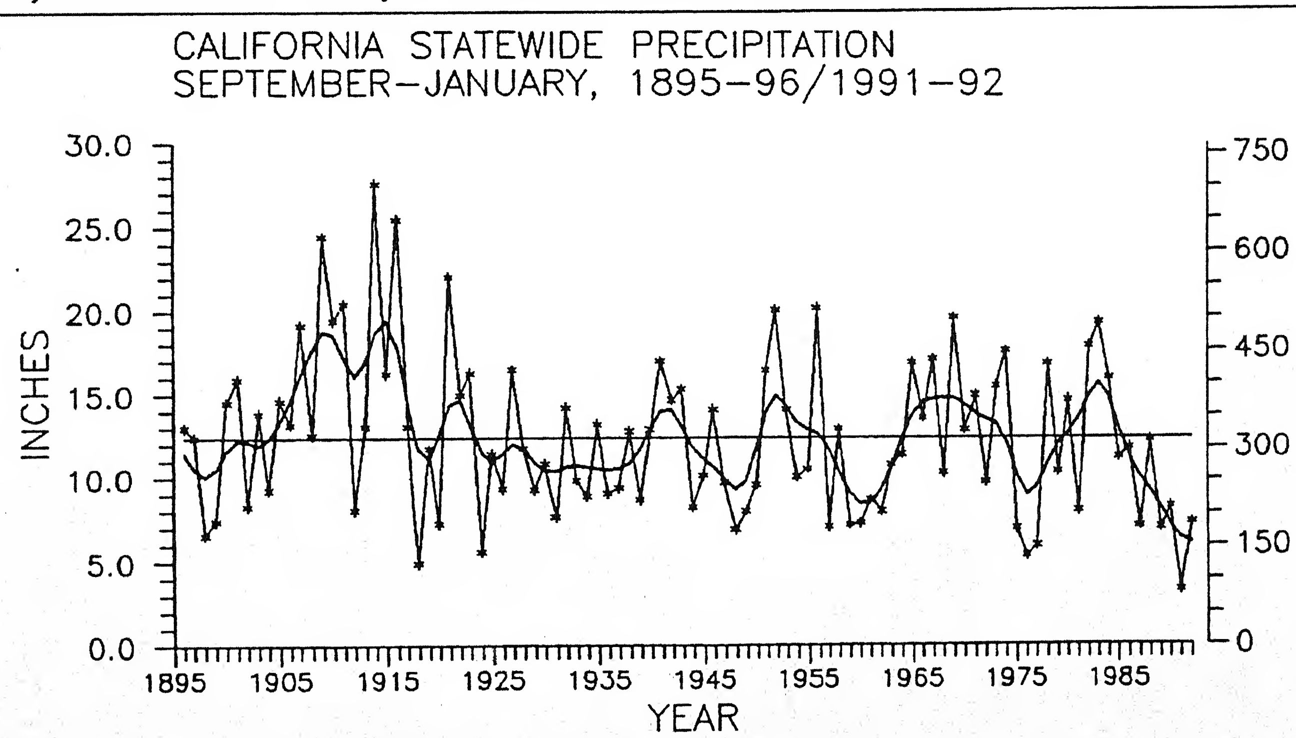


FIGURE 10. California Statewide Precipitation, September - January 1895/96 - 1991/92, as computed by the National Climatic Data Center. *September–January 1991/92 marks the eighth consecutive such period with below normal precipitation totals in California, bringing the long–term binomially–filtered trend (solid curved line) down to the lowest levels on record.*

SNOTEL UPDATE

Snow Water Equivalent Percent of Normal for the Western River Basins as of Feb. 4, 1992

Western Regional Climate Center

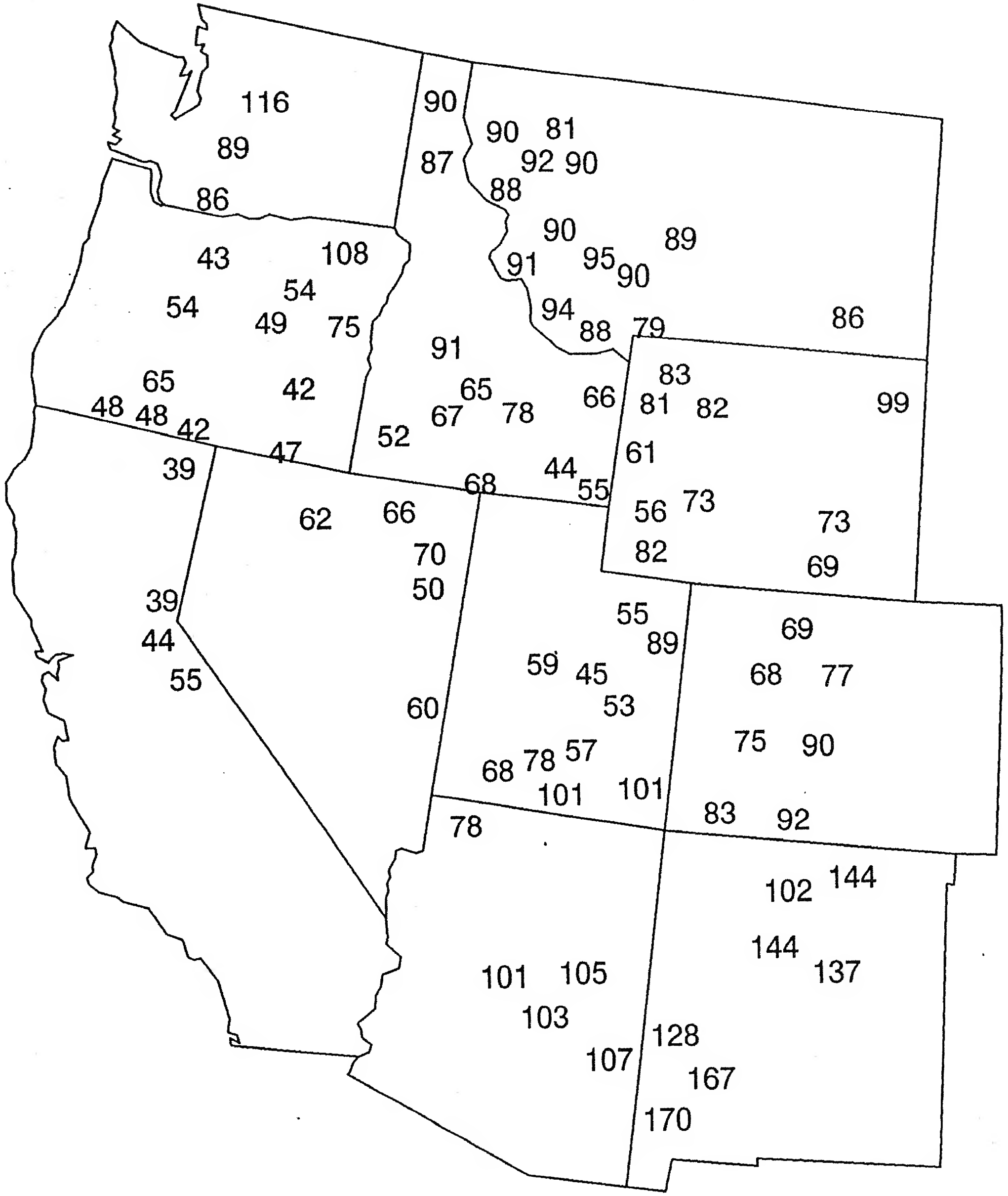
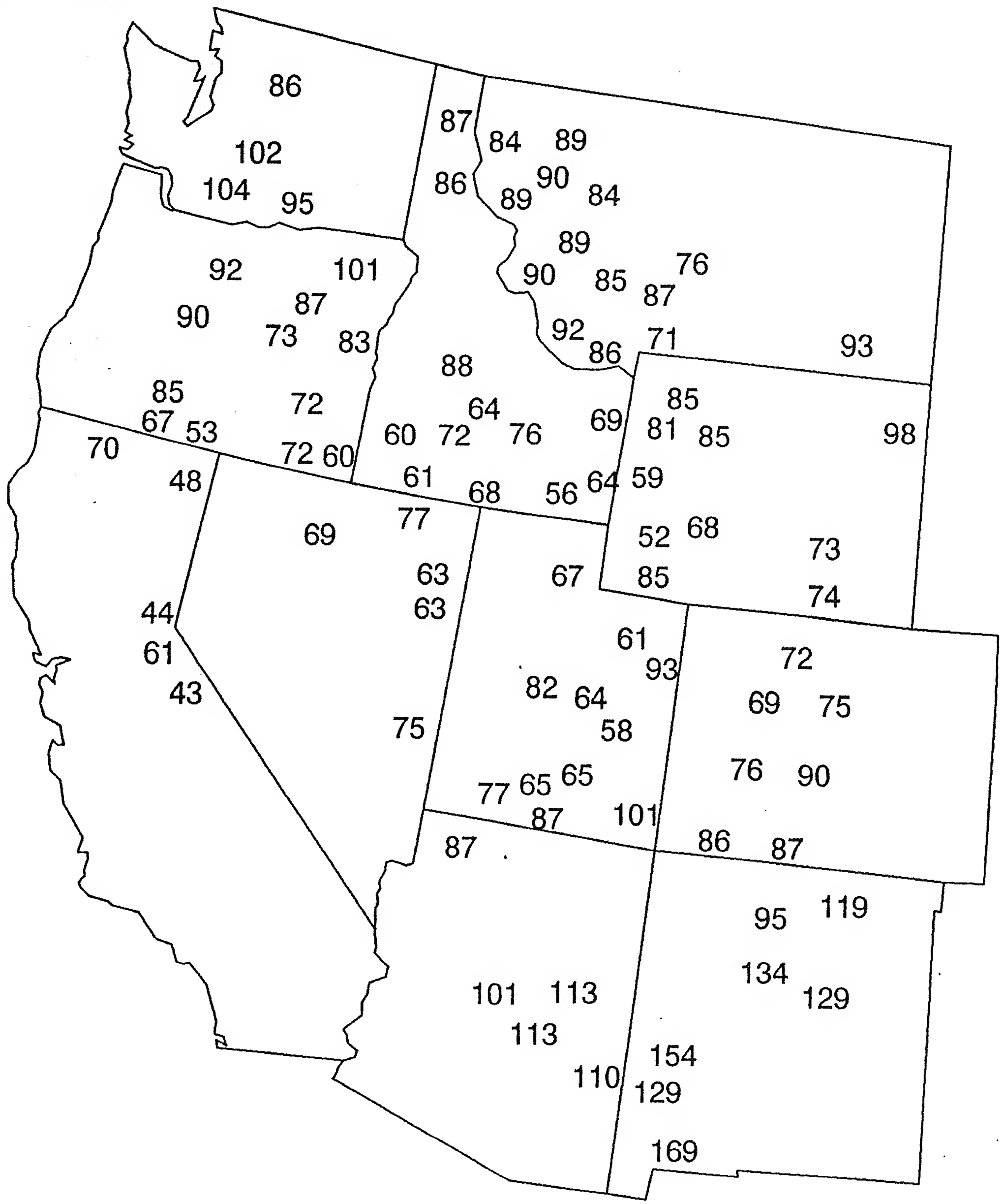


FIGURE 11. SNOTEL (SNOwfall TELemetry) Updates on the Percent of Normal Snow Water Equivalent as of February 4, 1992 for the Western River Basins. Data was collected from 560 individual mountainous sites, then grouped and averaged into their respective river basins. The values shown are for 91 river basins and were obtained from the Western Regional Climate Center, Reno, NV. *As expected, subnormal seasonal precipitation has produced well below normal snow water equivalents through most of the West as of February 4, 1992, except across the southern Rockies.*

SNOTEL UPDATE

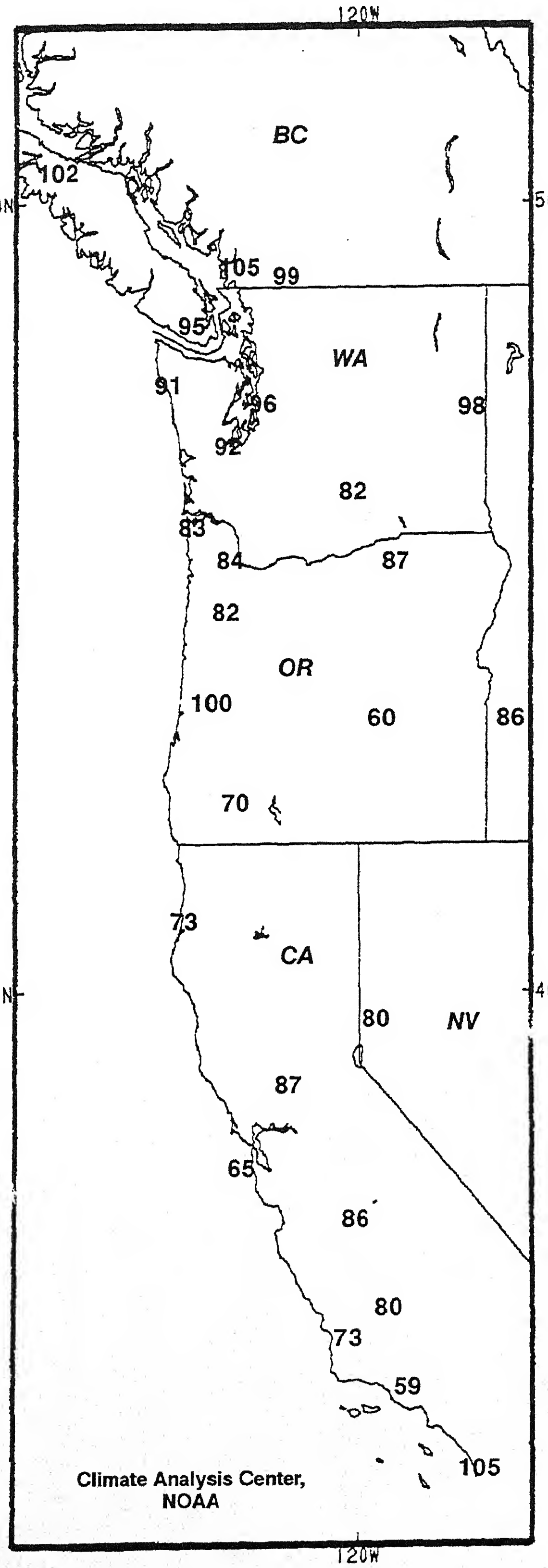
Percent of Normal Precipitation Oct 1, 1991 – Feb. 4, 1992 for the Western River Basins



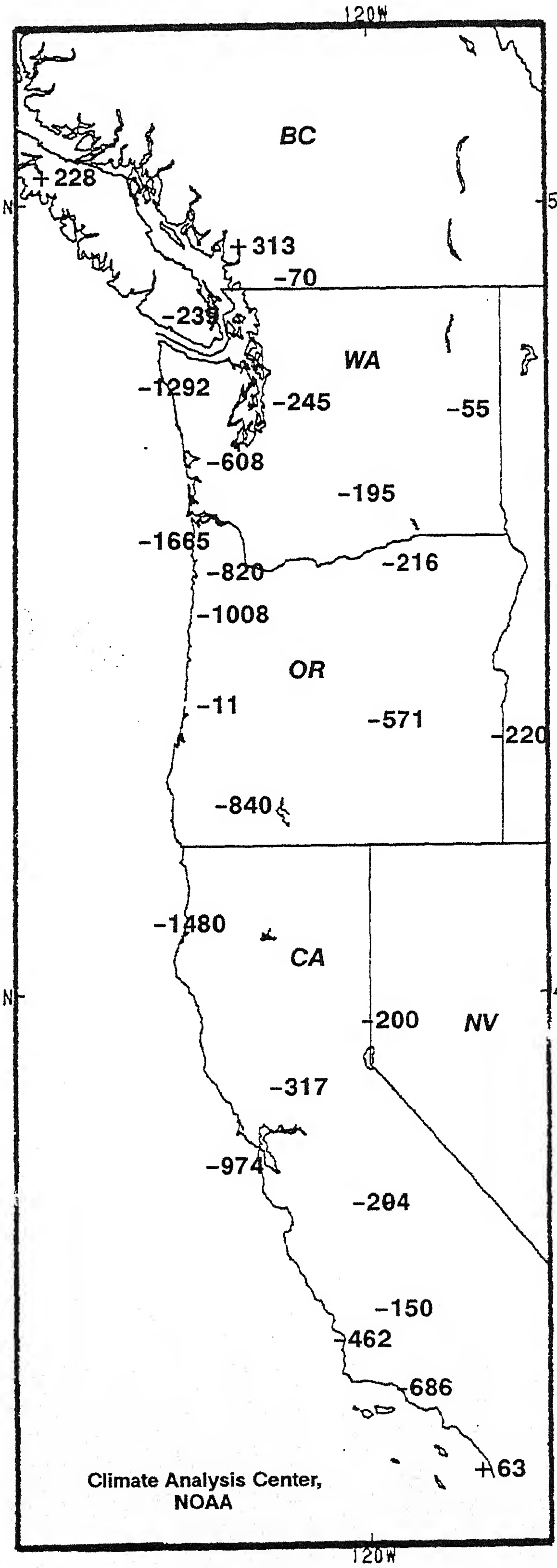
Western Regional Climate Center

FIGURE 12. SNOTEL (SNOwfall TELemetry) Update on the Percent of Normal Precipitation during October 1, 1991 – February 4, 1992 for the Western River Basins. The values shown are for 91 river basins and were obtained from the Western Regional Climate Center, Reno, NV. *Similar to Figure 11, most of the various river basins in the West have also measured subnormal precipitation since October, except in the southern Rockies.*

PERCENT OF NORMAL PRECIPITATION
October 1986 – January 1992



DEPARTURE FROM NORMAL PRECIPITATION (MM)
October 1986 – January 1992



Based on monthly data. At least 61 of the 64 months were required for inclusion.